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Fast and facile synthesis of highly-porous 1D/2D $CuCo_2O_4$ nanohybrids for flexible energy storage

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Flexible energy storage systems are of great importance as power supply components for next-generation portable/wearable electronics. Mixed transition metal oxides such as $NiCo_2O_4$, $FeCo_2O_4$ and $MnCo_2O_4$ have received increasing attention as high-performance supercapacitive materials due to their improved conductivity and superior electrochemical activity compared to conventional pseudocapacitive materials. In this work, a fast and facile microwave synthetic method combined with a post-annealing process is developed to synthesis a $CuCo_2O_4$ nanohybrid with a hierarchical highly-porous structure constructed by 1D nanorods and 2D nanoflakes. Acid-activated graphite papers are used as flexible substrates and current collectors. Structural, morphological and electrochemical performances of the as-synthesized $CuCo_2O_4$ nanohybrid are comprehensively studied. Benefiting from its abundant hierarchical pores and enhanced electrochemical activity, the $CuCo_2O_4$ nanohybrid can deliver excellent electrochemical performance: high mass specific capacity (1437 F g^{-1} at 1 A g^{-1}), good cyclic stability (93% retention at 5 A g^{-1} after 10000 cycles) and good rate performance (894 F g^{-1} at 10 A g^{-1}). A flexible solid-state asymmetric supercapacitor device was further fabricated, which could achieve a superior areal specific capacitance, as well as enhanced rate capability and cyclic stability, compared to most of reported transition metal oxide based supercapacitor devices. The results suggest that the highly-porous 1D/2D $CuCo_2O_4$ nanohybrids are a promising electrode material for flexible energy storage applications.

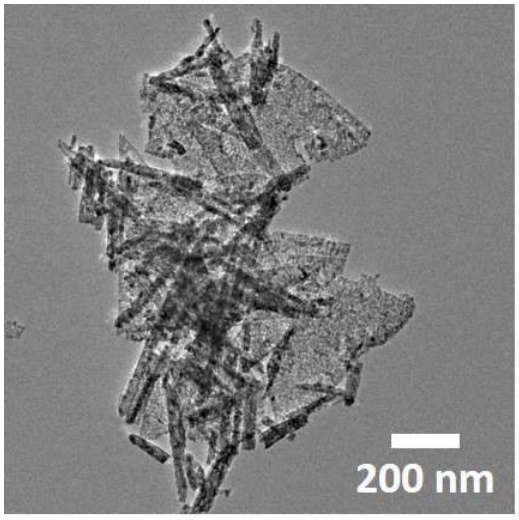

Fig.1 A transmission electron microscopy image of the highly-porous 1D/2D $CuCo_2O_4$ nanohybrids.

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